Operating Manual

PacDrive™
HMI Libraries

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ELAU PACKAGING SOLUTIONS

Schneider Electric

Imprint

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1 On this manual

1.1 Introduction

Before using ELAU components for the first time, you should familiarize yourself with this operating manual.

In particular, observe the safety notes described in chapter 2.

Only persons who meet the criteria for "Selection and Qualification of Staff" (see chapter 2.4) are allowed to work on ELAU components.

One copy of this manual has to be available for staff working on the components at all times.

This manual helps you use the component safely and expertly and as directed.

Observe this manual. This will help to avoid risks, reduce repair costs and down times and increase the lifetime and reliability of the products.

You also need to observe the valid rules for the prevention of accidents and for environmental protection in the country and place where the device is used.

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1.2 Symbols, Signs and Forms of Depiction

The following symbols and signs are used in this document:

Depiction	Meaning
■	First level enumeration sign.
–	Second level enumeration sign.
⏵	**Action symbol**: The text following this symbol includes an instruction for action. Execute the instruction actions in the given order, from top to bottom.
✓	**Result symbol**: The text following this symbol contains the result of an action.
Italics	If the describing text contains special terms (e.g. parameters) then they are written in italics.
Serif font	If the manual contains program code, it is marked by Serif font.
	Information symbol: This symbol marks notes and useful tips for using the product.
	Warning sign: Safety notes can be found in the relevant places. They are marked with this symbol.
	After this symbol, information about contents of the chapter follows as guideline assistance.

Table 1-1: Symbols, signs and forms of depiction

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2 General Safety Notes

This chapter contains general requirements for working safely. Every person using ELAU components or working on ELAU components has to read and observe these general safety notes.

If activities involve a residual risk, you will find a clear note in the respective places. The note describes the risk that may occur and preventive measures to avoid that risk.

2.1 Basics

The ELAU components are built according to the state of technology and generally accepted safety rules. Nevertheless, their use may cause a risk to life and limb or material damage if:

- you do not use the components as directed
- work on the components is not done by experts or instructed staff
- you inexpertly alter or modify a component
- you fail to test the protective measures in place after installation, commissioning or servicing
- you do not observe the safety notes and regulations.

Only operate the components in perfect technical condition, as directed, with regard to safety and risks and observe this manual.

The flawless and safe operation of the components requires appropriate transport, storage, mounting and installation as well as careful maintenance.

In case of any circumstances that impair the safety and cause changes in the operating behavior, immediately put the component(s) to a stop and inform the service staff in charge.

In addition to this manual, observe

- the prohibiting, warning and mandatory signs on the component, the connected components and in the switching cabinet
- the relevant laws and regulations
- the operating manuals of the other components
- the universally valid local and national rules for safety and the prevention of accidents.

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2.2 Depiction of Safety Notes

Risk categories

The safety notes in this manual are grouped into different risk categories. The table below shows which risk and possible consequences the symbol (pictograph) and the signal words indicate.

Pictograph	Signal word	Definition
	DANGER!	Indicates an immediately dangerous situation that will result in death or very serious injuries if the safety rules are not observed.
	WARNING!	Indicates a possibly dangerous situation that can result in serious injuries or major material damage if the safety rules are not observed.
	CAUTION!	Indicates a possibly dangerous situation that might result in material damage if the safety rules are not observed.

Table 2-1: Risk categories

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2.3 Use as Directed

The ELAU components are designed for installation in a machine/ plant or for combination with other components to form a machine/ plant. The components may only be used under the installation and operating conditions described in this documentation. You must use the accessories and ancillary parts (components, cables, etc.) mentioned in the documentation. You must not use any foreign objects or components that are not explicitly approved by ELAU.

"Use as directed" also means that you

- observe the Operating Manuals and other documentations (see appendix),
- observe the instructions for inspection and maintenance.

Use other than directed

The operating conditions at the place where the device is used must be checked on the basis of the given technical data (performance information and ambient conditions) and observed.

2.4 Selection and Qualification of Staff

This manual is aimed exclusively at technically qualified staff with detailed knowledge in the field of automation technology.

Only qualified staff can recognize the significance of safety notes and implement them accordingly.

This manual is aimed in particular at design and application engineers in the fields of mechanical and electrical engineering, at programmers, service and commissioning engineers.

Working on electrical equipment

Work on electrical equipment must only be done by qualified electricians or by instructed staff supervised by an electrician according to the electrotechnical rules.

An electrician is a person who, due to his vocational training, know-how and experience as well as knowledge of the valid regulations, is able to:

- evaluate the work he is supposed to do
- identify potential risks
- implement suitable safety measures.

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3 Overview

The HMI libraries are an extension to the ’standard’ libraries that come with EPAS-4.

There are three HMI libraries:

- ModBus_Vxxyyzz.lib
  for connection to ModBus.
- HMI_PCS_Vxxyyzz.lib
  for connection to Lauer PCS.
- HMI_Simatic_Vxxyyzz.lib
  for connection to Simatic.

The HMI libraries are based on the ’standard’ libraries.

NOTE

Before you start using the HMI libraries, we urgently recommend you to participate in an ELAU seminar in order to gain a better understanding of the function blocks and functions as well as receive programming tips from ELAU.

4 System Requirements

Before installing the HMI libraries, please make sure your system meets these minimum requirements:

- EPAS-4 Professional V00.06.00 or higher
- Windows 98 or Windows NT 4.0 (service pack 5 or higher recommended), Windows 2000 / XP Prof.
- Pentium 200 MMX or higher
- 256 MB RAM
- free serial interface
- free hard disk space > 100 MB
- 3 ½ inch floppy disk drive 1.44 MB
- color screen with a resolution of 800x600 pixels
- CD-ROM drive (at least double-speed)

recommended configuration

- EPAS-4 Professional V00.06.00 or higher
- Windows 2000 / XP Prof or Windows NT 4.0 (service pack 5 or higher recommended)
- Pentium II 350 or higher
- 512 MB RAM
- TCP / IP network connection (10 Mbps)
- free hard disk space > 500 MB
- 3 ½ inch floppy disk drive 1.44 MB
- color screen with a resolution of 1024x768 pixels
- CD-ROM drive

5 Installation

The HMI libraries are included in EPAS-4 Professional (V00.10.00 or higher) and therefore need not be installed separately.

See also Operating Manual EPAS-4

6 Working with Functions and Function Blocks

6.1 In General

The functions and function blocks of the library are described below according to a standard scheme:

- Task
- Short description of the task to be solved with this function block.
- Sketch of the system structure
- System structure of a sample application or other suitable graphic description
- Function description
  Plain text description of the function block
- State diagram
  State diagram for the function block with detailed know-how that may be required for special applications.
  Many tasks can be systematically described with the help of state diagrams or state machines.
  A state machine is characterised by states, conditions under which it takes states and functions that are executed when changing state.

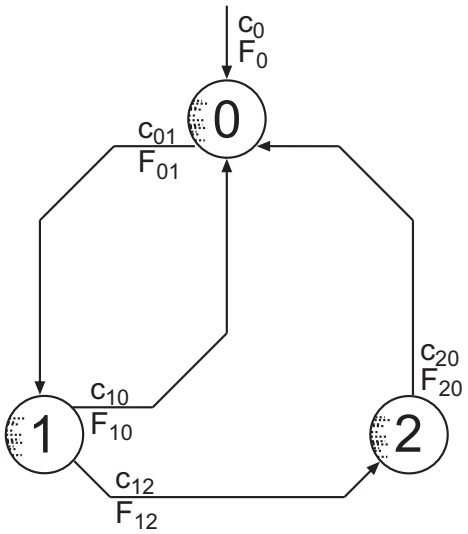

Fig. 6-1: State diagram

This image shows a state machine with three states 0, 1 and 2.

c_{01} is the condition for getting from state 0 to state 1.

F_{01} is the function executed when changing from state 0 to state 1.

c_0 is the start condition, F_0 is the start function.

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Machine in state 0:

If the condition c_{01} is met, the function F_{01} is executed and the machine changes to state 1. It will remain there until conditions c_{10} or c_{12} are fulfilled.

The above state machine can describe e.g. the following motion task:

Start of the machine

c_0:	start enable
F_0:	issue ‘ready’
State 0:	ready to start
c_{01}:	start signal recognised
F_{01}:	positioning task
State 1:	drive to target position
c_{12}:	target change recognised
F_{12}:	set new target position
c_{10}:	target position reached
F_{10}:	issue ‘target position reached’
State 2:	drive to changed target position
c_{20}:	corrected target reached
F_{20}:	issue ‘corrected target reached’

- Call
  Calls a function block in FBD (and/or maybe in ST)
- Declaration of the interface
  Describes the input and output parameters of the function block Result of the function block.
- Examples
  Suitable examples to impart the function of a component to the user in a “simple” environment or “stand-alone”.

NOTE

It may happen that a function description contains not all of the points in this scheme.

The function blocks of HMI.Lib have the following basic characteristics:

Cyclic call

The function blocks (FCs) are designed for cyclic applications. A typical cycle time is 5 ms.

General inputs and outputs

The following inputs and outputs are obligatory for all FCs of the HMI.Lib

Input: Enable

The input *Enable* (BOOL) enables the component and initialises it when it is first called. When leaving, the component is “tidied up“, i.e. all motions are stopped. System functions that were activated are deactivated, global and output variables are set accordingly, etc.

Output Active

The output *Active* (BOOL) is TRUE if Enable is TRUE and there is no error (Result >= 0).

Output Result

The output *Result* (DINT) normally shows the state of the FC. In case of an error, it shows the corresponding error number. The error numbers are non-equivocal for all FCs and contained in a common list.

6.2 Connection to Lauer PCS

6.2.1 In General

The Lauer PCS topline series (micro, mini, midi and maxi) are a group of operating consoles which can be operated always with the same drivers. For communication via serial interface, for example, Lauer offers the drivers *simmini.drv* and *simmidi.drv*. A serial driver for PCS topline maxi is not yet available.

Series	Units
PCS topline micro	PCS 009, PCS 009plus
PCS topline mini	PCS 090, PCS 090plus, PCS 095, PCS 095plus
PCS topline midi	PCS 900, PCS 920, PCS 950 (PCS 950c)
PCS topline maxi	PCS 900, PCS 9100

Table 6-1: .Lauer PCS series

6.2.2 HMI_PCS_topline_midi (Function Block)

Task:

Conversion from BCD to Decimal for date and time of PCS topline series midi.

NOTE

The use of this function block is only sensible in combination with the function block HMI_PCS_topline_PBDP or HMI_PCS_topline_Serial.

Sketch of the system structure:

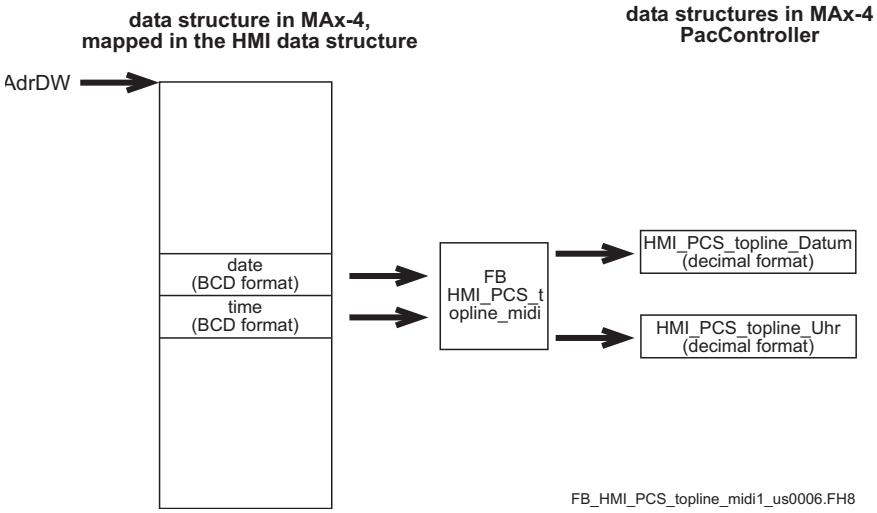


Table 6-2: Sketch of the data structures: PCS topline midi

Function description:

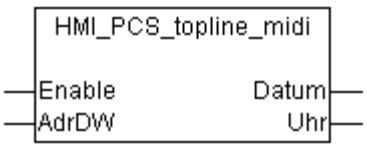
This component converts the date and time of the PCS topline series midi from BCD to Decimal format.

With the PCS topline series midi, date and time are firmly defined in the structure. The component reads date and time in this structure, converts them and stores them in its own structures (*HMI_PCS_topline_Date* and *HMI_PCS_topline_Time*).

Requirements:

none

Call in FBD:



Declaration of the interface:

```
FUNCTION_BLOCK HMI_PCS_topline_midi
VAR_INPUT
  Enable: BOOL;      (* enable conversion *)
  AdrDW : DWORD;(*address to global structure of datafieldwords*)
END_VAR
VAR_OUTPUT
  Date  : HMI_PCS_topline_Date;(*local structure of date*)
  Time  : HMI_PCS_topline_Time;(*local structure of time*)
END_VAR

Structures:
TYPE HMI_PCS_topline_Date :
STRUCT
  year  : WORD;
  day   : BYTE;
  month : BYTE;
END_STRUCT
END_TYPE

TYPE HMI_PCS_topline_Time :
STRUCT
  hour  : BYTE;
  weekday: BYTE;
  second: BYTE;
  minute: BYTE;
END_STRUCT
END_TYPE
```

Result:

no result

Examples:

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6.2.3 HMI_PCS_topline_PBDP (Function Block)

Task:

Connection of PCS topline operating terminals to the PacDrive Controller via PROFIBUS DP.

Sketch of the system structure:

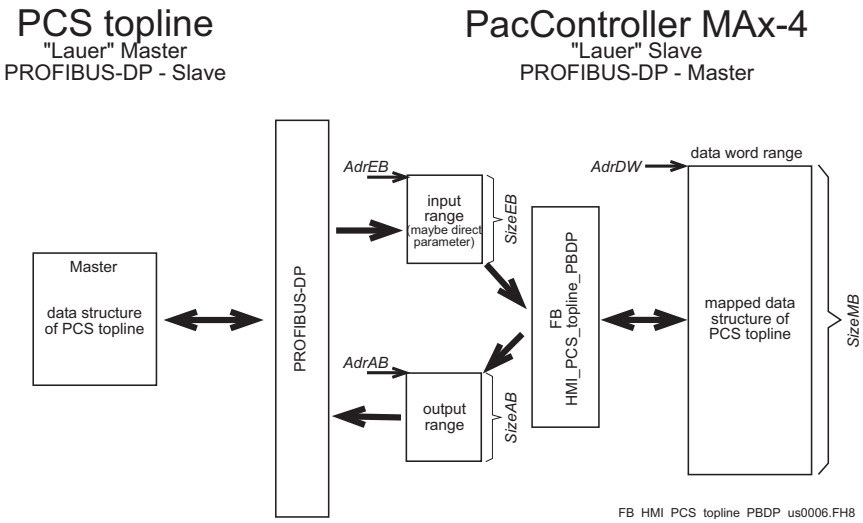


Table 6-3: Sketch of data structures: PCS topline PBDP

Function description:

This component is used for the communication between the PacDrive Controller and a Lauer PCS topline operating unit (HMI), e.g. PCS 095plus, using the PROFIBUS DP protocol. In principle, the communication happens in such a way that the HMI sends a request to the PacDrive Controller, which upon receipt returns its answer. This means that the activity is always initiated by the HMI. The PacDrive Controller is a slave. Only one slave is possible.

The FC is set ready for communication by means of a positive edge on *Enable*. A falling edge on *Enable* terminates the FC's readiness for communication.

Communication is monitored via the input *Timeout*. A maximum time (typically in milliseconds) that may lie between two request telegrams is transmitted here. If the time is exceeded, the *Result* is set accordingly. By default, the *Timeout* is set to 1000 ms.

The address of the data word range on the PacDrive Controller must be transmitted in *AdrDW*. This data word range is usually a structure oriented at the corresponding HMI.

The start address of the input range (input address in the basic parameters of the PacDrive Controller PROFIBUS DP module) is transmitted in *AdrEB*.

The start address of the output range (output address in the basic parameters of the PacDrive Controller PROFIBUS DP module) is transmitted in *AdrAB*.

The size of the data word range in bytes (number of marker bytes) is entered in *SizeMB*. The transmission value is always equivalent to the value SIZEOF (DW). By default, *SizeMB* is 512, which is equivalent to 256 data words.

The size of the input range is entered in *SizeEB*.

See also PROFIBUS DP Configurator – Inputs/Outputs –Input Length

NOTE

If direct parameters are used, *AdrEB* rises by the number of direct parameters and *SizeEB* decreases by the number of direct parameters. The direct parameters are configured in the HMI. Up to 4 direct parameters can be configured.

The size of the output range is entered in *SizeAB*.

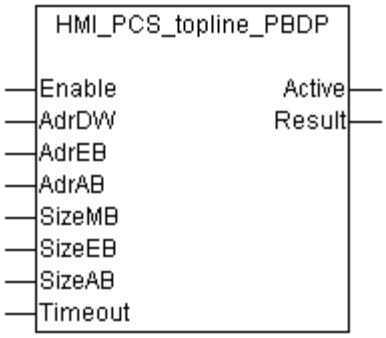
see also PROFIBUS DP Configurator – Inputs/Outputs –Output Length

The output *Active* indicates whether a component is being processed error-free at a certain time.

Requirements:

PBDP_M_V000600.lib or higher

Call in FBD:



Declaration of the interface:

```
FUNCTION_BLOCK HMI_PCS_topline_PBDP
VAR_INPUT
  Enable: BOOL;(* Enable Communication *)
  AdrDW:  DWORD;(* address of array of datafieldwords *)
  AdrEB:  DWORD;(* address of array of inputbytes *)
  AdrAB:  DWORD;(* address of array of outputbytes *)
  SizeMB: DINT:= 512;(*size of array of datafieldwords in byte*)
  SizeEB: DINT:= 8;(* size of array of inputbytes *)
  SizeAB: DINT:= 8;(* size of array of outputbytes *)
  Timeout: TIME:= t#1s;
END_VAR
VAR_OUTPUT
  Active: BOOL;(* FB active *)
  Result: DINT;
END_VAR
```

Result:

0 -> no error

< 0 -> for error codes refer to DATATYPE eErrorCode in Basic.Lib

Examples:

6.2.4 HMI_PCS_topline_Serial (Function Block)

Task:

Connection of PCS topline operating terminals to the PacDrive Controller via the COM 2 serial interface of the PacDrive Controller.

Sketch of the system structure:

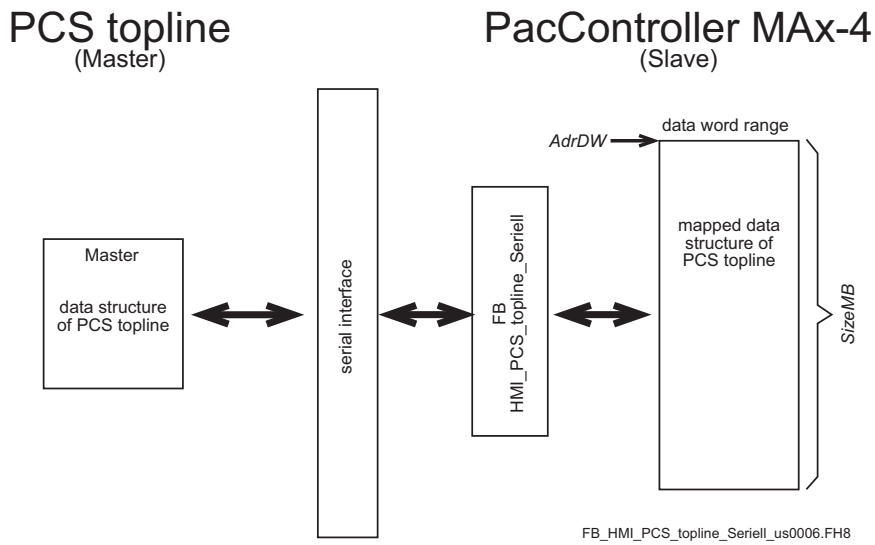


Table 6-4: PSketch of data structures: PCS topline serial

Function description:

This component is used for the communication between the PacDrive Controller and a Lauer PCS topline operating unit (HMI), e.g. PCS 095plus, using the serial interface. In principle, the communication happens in such a way that the HMI sends a request to the PacDrive Controller, which upon receipt returns its answer. This means that the activity is always initiated by the HMI. The PacDrive Controller is a slave. Only one slave is possible.

The FC is set ready for communication by means of a positive edge on *Enable*. A falling edge on *Enable* terminates the FC's readiness for communication.

Communication is monitored via the input *Timeout*. A maximum time (typically in milliseconds) that may lie between two request telegrams is transmitted here. If the time is exceeded, the *Result* is set accordingly. By default, the *Timeout* is set to 1000 ms.

The address of the data word range on the PacDrive Controller must be transmitted in *AdrDW*. This data word range is usually a structure oriented at the corresponding HMI.

The size of the data word range in bytes (number of marker bytes) is entered in *SizeMB*. The transmission value is always equivalent to the value SIZEOF (DW). By default, *SizeMB* is 512, which is equivalent to 256 data words.

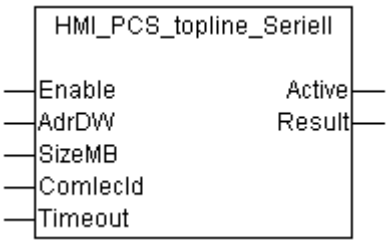
The address or ID of the COM object from the control configuration is transmitted in *ComIecId*.

The output *Active* indicates whether a component is being processed error-free at a certain time.

Requirements:

none

Call in FBD:



Declaration of the interface:

```
FUNCTION_BLOCK HMI_PCS_topline_Serial
VAR_INPUT
  Enable: BOOL;
  AdrDW: DWORD;
  SizeMB: DINT:= 512;
  ComIecId: DINT;(* ComIec Object-Id *)
  Timeout: TIME:= t#1s;
END_VAR
VAR_OUTPUT
  Active: BOOL;(* FB active *)
  Result: DINT;
END_VAR
```

Result:

≥ **0 -> no error (return values e.g. from ComIecRead)**

< 0 -> for error codes refer to DATATYPE eErrorCode in Basic.Lib

Examples:

Occupation of the interface cable:

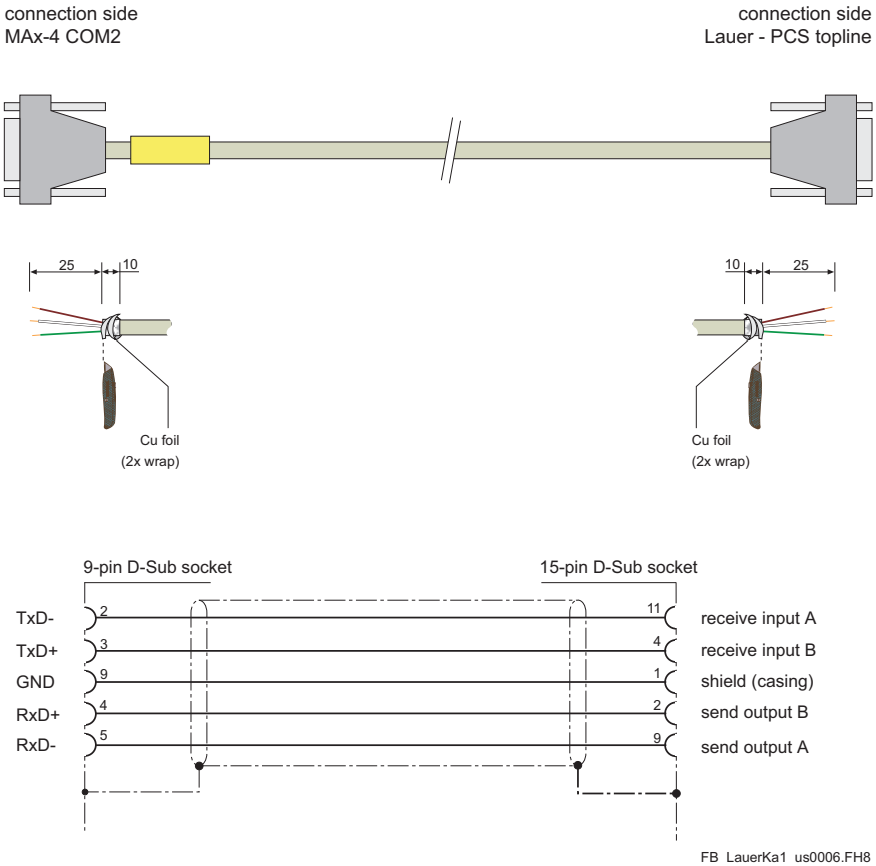


Table 6-5: Occupation of the interface cable for serial connection to PCS topline HMI

6.3 Connection to ModBus

6.3.1 Modbus (Function Block)

Task:

This function block can be used for external units to communicate with the PacDrive Controller via Modbus RTU protocol.

In this case, the PacDrive Controller always operates as the only slave, i.e. the external unit requests the communication, and PacDrive Controller replies to the requests.

Sketch of the system structure:

Communication structure

HMI and PacDrive Controller communicate via the serial interface. There are four data ranges in the IEC program on PacDrive Controller. Two of these ranges can be addressed bitwise, the other two wordwise. To exchange data, the HMI sends a request and a section is transmitted.

Function description:

This component is used for the communication between PacDrive Controller and HMI via the Modbus protocol (e.g. SIMATIC OP?? or ProFace). In principle, the communication happens in such a way that the HMI sends a request to the PacDrive Controller, which upon receipt returns its answer. This means that the activity is always initiated by the HMI. The PacDrive Controller is a slave. Only one slave is possible.

The FC is set ready for communication by means of a positive edge on *Enable*. A falling edge on *Enable* terminates the FC's readiness for communication.

If the input *Reset* is FALSE, a *Result* once set is no longer overwritten. If *Reset* is TRUE, the previous error is deleted and the actual *Result* is shown.

Communication is monitored via the input *Timeout*. A maximum time in milliseconds that may lie between two request telegrams is transmitted here. If the time is exceeded, the *Result* is set accordingly.

Moreover, the FC needs the slave number under which PacDrive Controller is addressed. Make sure that the number is identical with the one projected in the project tool of the visualization surface.

To access the interface, the ComIec object ID must be transmitted.

The corresponding ranges for the variables projected in the visualization tool must be declared in the EPAS-4 programming system as arrays with the required length.

The bit range 1x and the word range 3x are mere read ranges. The bit range 0x and the word range 4x are read/write ranges. This must be taken into account when creating a project.

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The array sizes can lie between 1 and 9999 (depending on the project).

Declaration example:

```
VAR CONSTANT
  s_iSizeofB0000: INT:=3000;
     (* define constant for size of array a_bArrB0000 *)
  s_iSizeofB1000: INT:=3000;
     (* define constant for size of array a_bArrB0000 *)
  s_iSizeofW3000:INT:=2500;
     (* define constant for size of array a_bArrB0000 *)
  s_iSizeofW4000:INT:=2500;
     (* define constant for size of array a_bArrB0000 *)
END_VAR

VAR
 a_bArrB0000:ARRAY[1..s_iSizeofB0000] OF
   BOOL:=s_iSizeofB0000(FALSE);
    (* define and initialize array for write and read bit
   values *)
 a_bArrB1000:ARRAY[1..s_iSizeofB1000] OF
   BOOL:=s_iSizeofB1000(FALSE);
    (* define and initialize array for read bit values *)
  a_bArrW3000:ARRAY[1..s_iSsizeofW3000] OF
   WORD:=s_iSizeofW3000(0);
(* define and initialize array for read word values *)
  a_bArrW4000:ARRAY[1..sizeofW4000] OF
   WORD:=s_iSizeofW4000(0);
    (* define and initialize array for write and read word
   values *)
  mMOD_BUS:Modbus;
END_VAR
```

As input variables, the FC needs the address of the corresponding array (e.g. ADR(a_bArrB0000)) and its length (e.g. s_iSizeofB000). Please define the lengths using constants, which are then transmitted to the FC, so that there can be no access outside the defined range.

Variables to be transmitted to the HMI must be copied in the PLC program to the corresponding places in the Modbus memory range; received variables must be read from the Modbus memory range.

Alternatively, the array fields can be used directly in the IEC program.

The Modbus process must be called up cyclically. The optimum cycle time depends on the baud rate (maximum 38400 baud), the time between the request telegrams (depending on the external unit) and the relevance of the data to be transmitted (only visualization, writing of variables on the control). The maximum adjustable cycle time basically depends on the timeout of the external unit (how long does it wait for a reply telegram). In most tests, a cycle time of 20 ms was used.

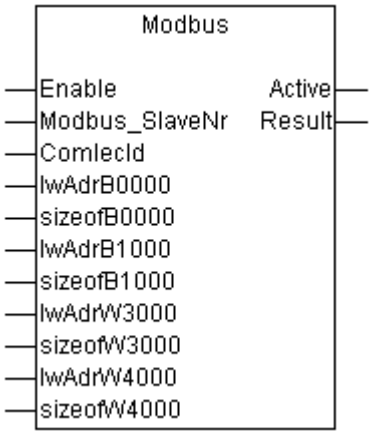
Requirements:

Max4_V000700.lib, TSC_V000702.lib, Standard.lib and Basic_V000701.lib

or

Max4_V001000.lib or higher, Standard.lib and Basic_V000701.lib

Call in FBD:



Declaration of the interface:

```
FUNCTION_BLOCK Modbus
VAR_INPUT
  Enable: BOOL;(* edge activates/deactivates FC *)
  Reset : BOOL;(* input on TRUE resets Result *)
  Timeout: UDINT;(* max. time between 2 request telegrams in ms*)
  Modbus_SlaveNo: INT;(* slave number within the Modbus system*)
  ComIecId:  DINT;(* logic address of ComIec object *)
  lwAdrB0000:  DWORD;(* address of array B0000 *)
  sizeofB0000: INT;(* number of elements in array B0000 *)
  lwAdrB1000:  DWORD;(* address of array B1000 *)
  sizeofB1000: INT;(* number of elements in array B1000 *)
  lwAdrW3000:  DWORD;(* address of array W3000 *)
  sizeofW3000: INT;(* number of elements in array W3000 *)
  lwAdrW4000:  DWORD;(* address of array W4000 *)
  sizeofW4000: INT;(* number of elements in array W4000 *)
END_VAR
VAR_OUTPUT
  Active: BOOL;(* status indication *)
  Result: DINT;(* return value *)
  State : (ComMODBUS_UNSYNCHRONIZED,ComMODBUS_SYNCHRONIZED,
   ComMODBUS_RECEIVE,ComMODBUS_Send);
(* state of communication *)
END_VAR
```

Result:

0 -> error-free execution

< 0 -> for error codes refer to DATATYPE eErrorCode in Basic.Lib

Examples:

Connection to Pro-face HMI

A 4-wire connection is to be established between the PacDrive Controller (COM2) and the HMI (SIO).

Occupation of the interface cable:

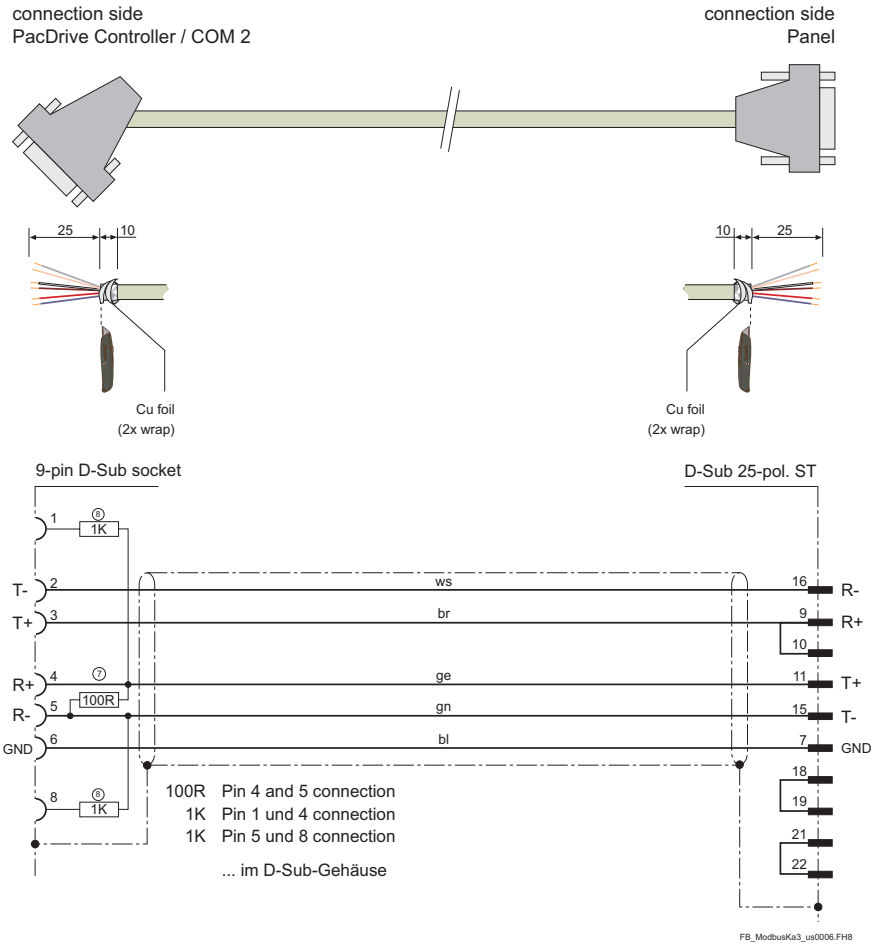


Table 6-6: Occupation of the interface cable for connection via ModBus to Pro-face HMI

Configuration of PacDrive Controller:

In the COM object in the control configuration, RS485 4-wire must be set as *SSType*.

Program in ST:

```
VAR CONSTANT
  s_iSizeofB0000  : INT:=3000;
  s_iSizeofB1000  : INT:=3000;
  s_iSizeofW3000 : INT:=2500;
  s_iSsizeofW4000 : INT:=2500;
END_VAR

VAR
  a_bArrB0000  :ARRAY[1..s_iSizeofB0000] OF BOOL
   :=s_iSizeofB0000(FALSE);
  a_bArrB1000  :ARRAY[1..s_iSizeofB1000] OF BOOL
   :=s_iSizeofB1000(FALSE);
  a_bArrW3000 :ARRAY[1..s_iSizeofW3000] OF
   WORD:=s_iSizeofW3000(0);
  a_bArrW4000 :ARRAY[1..s_iSizeofW4000] OF
   WORD:=s_iSizeofW4000(0);

     r_Modbus:Modbus;
END_VAR

(*the data to be transmitted can be copied to the Modbus
   arrays here*)
r_Modbus(Enable:=TRUE,Reset:=False,Timeout:=2000,Modbus_slav
   eNr:=1,ComIecId:=_ComIec,
   lwAdrB0000:=ADR(a_bArrB0000),sizeofB0000:=s_iSizeofB0000,
   lwAdrB1000:=ADR(a_bArrB1000),sizeofB1000:=s_iSizeofB1000,
   lwAdrW3000:=ADR(a_bArrW3000),sizeofW3000:=s_iSizeofW3000,
   lwAdrW4000:=ADR(a_bArrW4000),sizeofW4000:=s_iSizeofW4000);

IF r_modbus.Result<0  THEN
  GetResultText(Result:=r_modbus.Result);
(* issue message, if an error occurred *)
ELSE
(*the data transmitted from the Modbus array can be copied
   here*)
END_IF
```

Connection to Siemens HMI

NOTE

The Modbus connection was tested with an OP 27.
You can find further Siemens HMI units with Modbus connection in the Siemens User Manual Communication, Edition 05/99, Chapter 1.2 (manual available on the Internet at: http://www4.ad.siemens.de/infocs/livelink.exe?func=cslib.csinfo&startNode=2401&table=ProductNodes&lang=de&aktprim=0&nodeID0=2401&siteid=cs (last revision: May 2000))

A 4-wire connection is to be established between the PacDrive Controller (COM2) and the HMI (OP 27).

Occupation of the interface cable:

An SA-1 protocol converter is needed to connect the HMI (IF1A).

Cable from HMI (IF1A) to SA-1

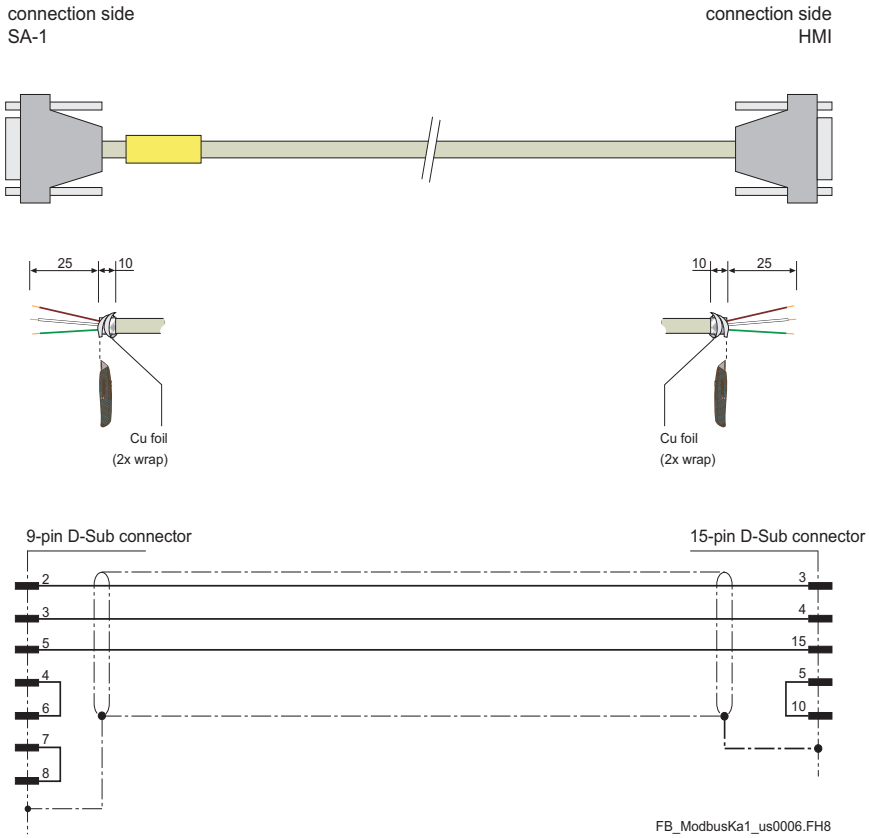


Table 6-7: Occupation of the interface cable for connection via ModBus to Siemens HMI (HMI / SA-1)

Cable from SA-1 to PacDrive Controller (Com2)

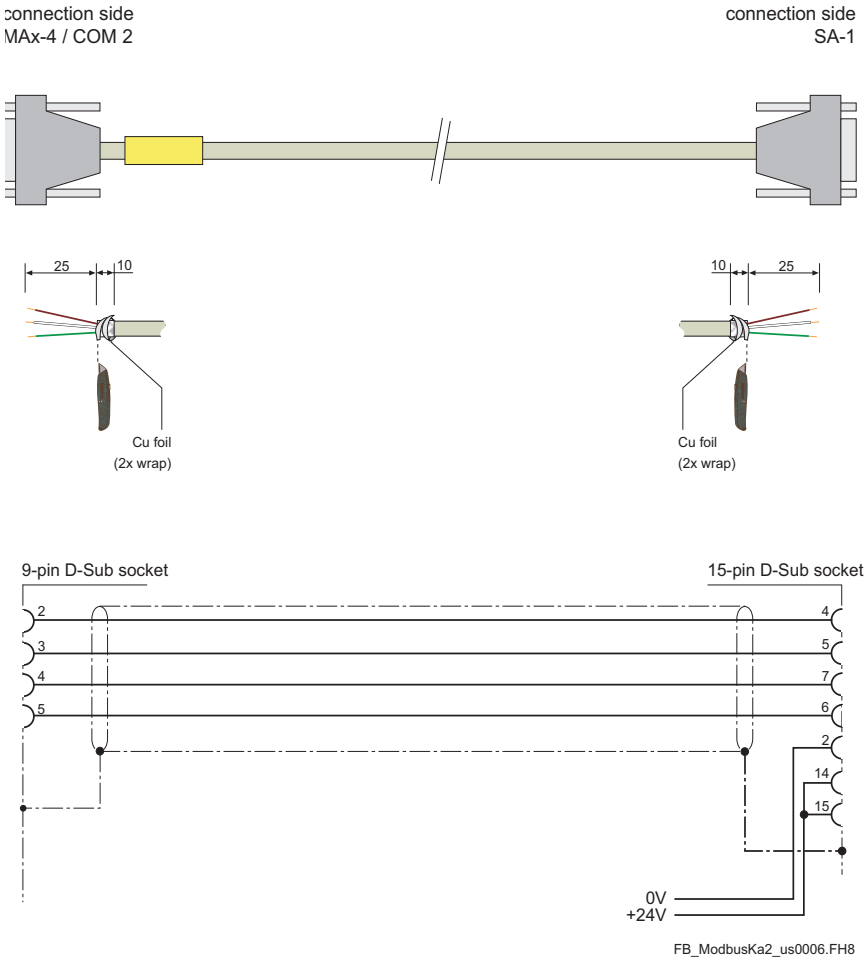


Table 6-8: Occupation of the interface cable for connection via ModBus to Siemens HMI (SA-1 / PacDrive Controller)

Configuration of the PacDrive Controller:

In the COM object, RS485 4-wire connection must be set.

Configuration of HMI:

Modicon Modbus must be entered as protocol at the interface IF1A.

984 must be entered as PLC.

6.4 Connection to Simatic

6.4.1 ComHMI (Function Block)

Task:

Connection of Simatic HMI operating terminal to the PacDrive Controller via the COM 2 serial interface of the PacDrive Controller.

Sketch of the system structure:

Communication structure

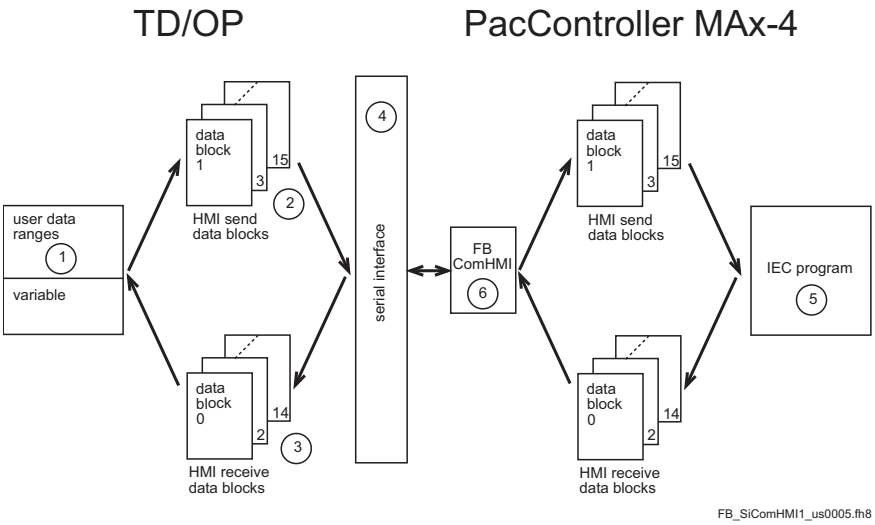


Table 6-9: Sketch of communication structure: Simatic HMI / PacDrive Controller

TD/OP and PacDrive Controller communicate by exchanging data blocks via the serial interface (4). The transmission from the control to the TD/OP is done via receive data blocks (3), from the TD/OP to the PacDrive Controller via send data blocks (2). It is the job of the IEC program (5) to prepare the data blocks for transmission to the TD/OP and evaluate the received data blocks.

The data blocks are sent and received via drivers of the TD/OP and the PacDrive Controller (6).

Depending on the project and application of the TD/OP unit used, different user data ranges (1) must be set up in the PacDrive Controller if the corresponding function is to be used. The position of the user data ranges and variables is mentioned in the project. The data blocks for transmission to the TD/OP (receive data blocks) must be prepared and the received data blocks (send data blocks) must be evaluated in the IEC program.

Function description:

This component is used for the communication between PacDrive Controller and an HMI (SIMATIC TP??/OP??) via the COM2 port. In principle, the communication happens in such a way that the HMI sends a block to the PacDrive Controller, which upon receipt returns a block. This means that the activity is always initiated by the HMI.

The FC is set ready for communication by means of a positive edge on *Enable*. While the FC is ready for communication, the parameters *NoOfBlocks*, *AdrOfBlocks* and *ComIecId* must not be changed. A falling edge on *Enable* terminates the FC's readiness for communication.

The transmitted ComIec object must be added to the control configuration and be already open („IecOpen(_ComIecId);“).

NoOfBlocks specifies the number of blocks for which memory space is reserved at the address *AdrOfBlocks*. So *AdrOfBlocks* must point to an ARRAY [0..NoOfBlocks-1] OF DATABLOCK. *NoOfBlocks* is always an even number, because a send block i-1 (even number) must be defined for every receive block i (odd number). For every block, the length must be given according to the HMI configuration via ProTools (e.g. Block[i].Length:=30, if block i is 30 words long. In this case the greatest available variable block is Variable Block[i].Data[29]). The numbering of the words under ProTool is identical with the index of the Data array in Datatype DataBlock, i.e.: Block 1 word 20 in ProTool is equivalent to Block[1].Data[20] in EPAS-4.

If the data blocks 0 or 1 are not used, you need to enter the following lengths:

Length block 0: 9

Length block 1: 19

If the input *Reset* is low, an error once set is no longer reset until the input changes to high. Then all previous errors are cancelled and only the errors caused just now are shown in *Result*.

If the input *LifeControl* is high, the life bit monitoring is activated.

The error threshold for the life bit monitoring is set with the input *LifeTime*. Depending on the HMI unit, it may be necessary to increase the error threshold.

A rising edge on the input *Reboot* causes the HMI to reboot. The high signal on Reboot must not be lifted until the completion of the reboot process is signalled by a rising edge on RebootDone.

A rising edge on the input *GiveOrder* triggers the control order specified with *Order*, *Parameter1*, *Parameter2* and *Parameter3*. None of these five parameters may be changed until the completion of the order is indicated by a rising edge on *OrderDone*.

The possible orders that can be transmitted with the parameter Order and the meaning of the corresponding parameters are described in the manual 'SIMATIC HMI Communication User

Manual', Siemens order number: 6AV3991-1BC06-0AA0 Appendix B Control Orders.

If order number 41 was given (transmit date and time from HMI to PacDrive Controller), the complete transmission of the time is indicated by a rising edge on *TimeReceived* and the complete receipt of the date by a rising edge on *DateReceived*. The received data are then available in Hour, Minute, Second, respectively in Weekday, Day, Month, Year.

If the HMI triggered an alarm, a rising edge is issued on AlarmReceived and the corresponding flag is set in *Alarm01_16*, *Alarm17_32* or *Alarm33_48*.

A rising edge on *DataReceived* signals the receipt of the transmission initiated by control order 70. The requested receipt is then available in the data tray.

Communications supplies the number of data blocks transmitted successfully since the last activation of the component; Errors supplies the number of failed transmissions. Communication does not run safely unless several successfully transmitted data blocks are shown at the output *Communications*. The reason is that an incomplete protocol, the structure of which complies with the protocol requirements, may be received when booting.

The ComHMI process must be called up cyclically every 200 ms or more often.

State diagram:

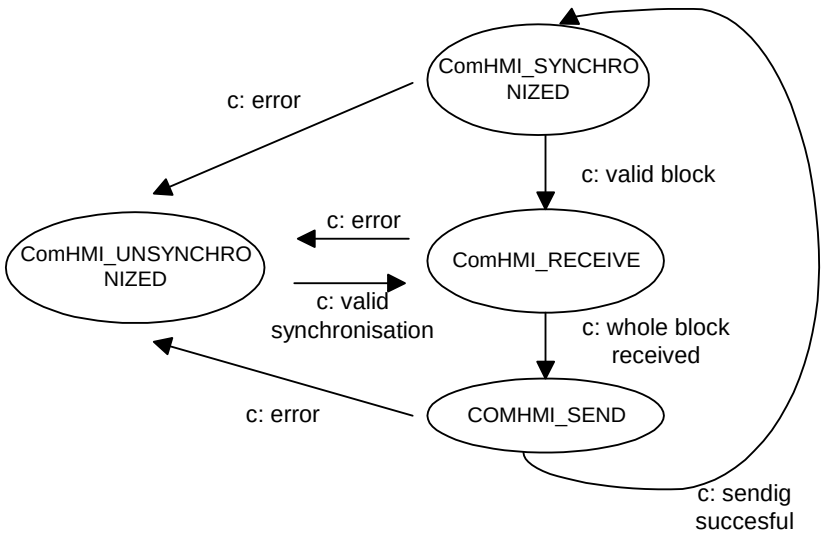


Table 6-10: State diagram ComHMI

PD_OperaManHMI_Lib_06_us.FM

Requirements:

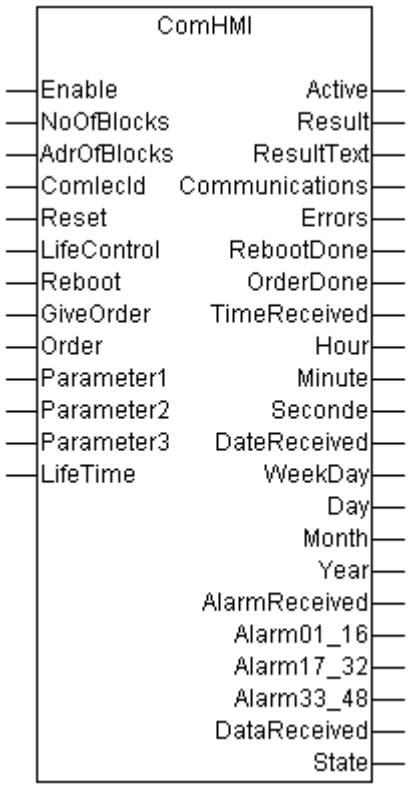
Standard.lib

MAx4_v000600.lib or higher

Basic_V000600.lib or higher

PLC_V000600.lib or higher

Call in FBD:



Declaration of the interface:

```
FUNCTION_BLOCK ComHMI
VAR_INPUT
  Enable   : BOOL;  (* edge activates/deactivates FC *)
  NoOfBlocks: WORD;  (* data blocks being exchanged *)
  AdrOfBlocks: POINTER TO ARRAY [ 0 .. 15 ] OF DATABLOCK;
(* pointer to data blocks *)
  ComIecId : DINT;  (* ComIec object: e.g. _ComIec *)
  Reset    : BOOL; (* TRUE: all errors are reset *)
  LifeControl: BOOL;  (* (de)activate life bit monitoring *)
  Reboot:BOOL;(* rising edge triggers a reboot of HMI *)
  GiveOrder: BOOL;
(* rising edge initiates a control order *)
  Order    : WORD;  (* number of a control order *)
  Parameter1: WORD;  (* 1st parameter of the control order *)
  Parameter2: WORD;  (* 2nd parameter of the control order *)
  Parameter3: WORD;  (* 3rd parameter of the control order *)
  LifeTime : INT := 3; (* no. of admissible life bit errors *)
END_VAR
VAR_OUTPUT
  Active : BOOL;(* state indicator *)
  Result: INT;(* return value *)
  ResultText: STRING;(* explanation text on result *)
  Communications: WORD;(* no. of successfully transmitted
   data blocks *)
  Errors: WORD;(* no. of failed transmissions *)
  RebootDone: BOOL;(* pos. edge if HMI reboot *)
  OrderDone: BOOL;(* pos. edge if control order executed *)
  TimeReceived: BOOL;(*pos. edge if time received after order41*)
  Hour  : BYTE;(* time received *)
  Minute: BYTE;(* time received *)
  Second: BYTE;(* time received *)
  DateReceived: BOOL;(*pos. edge if date received after order41*)
  WeekDay: BYTE;(* date received *)
  Day   : BYTE;(* date received *)
  Month : BYTE;(* date received *)
  Year  : BYTE;(* date received *)
  AlarmReceived: BOOL;(* rising edge if alarm received *)
  Alarm01_16: Unpack16;(* alarm received *)
  Alarm17_32: Unpack16;(* alarm received *)
  Alarm33_48: Unpack16;(* alarm received *)
  DataReceived: BOOL;(* pos. edge if data received after
   order70 *)
  State : ( ComHMI_UNSYNCHRONIZED, ComHMI_SYNCHRONIZED,
                  ComHMI_RECEIVE, ComHMI_SEND );
END_VAR
```

Result:

0 -> error-free execution
-42: -> timeout
-222: -> device error while sending
-223: -> device error while reading
-233: -> life bit error

< 0 -> An error occured. The error is explained in ResultText.

Examples:

A 4-wire connection is to be established between the PacDrive Controller (COM2) and the HMI (IF1B).

Occupation of the interface cable:

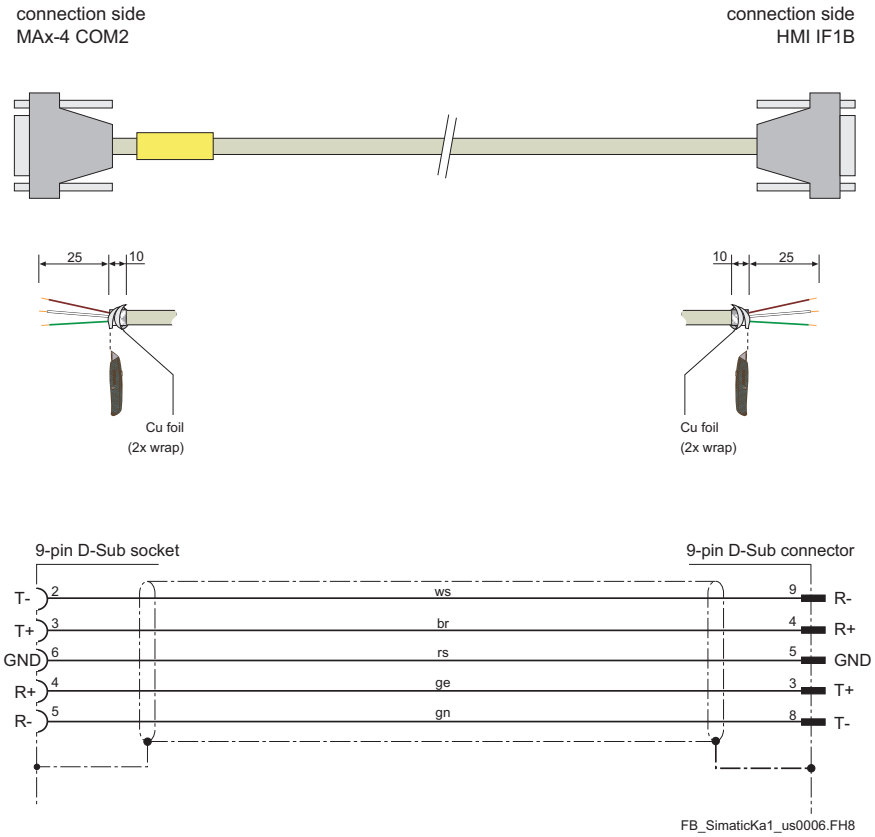


Table 6-11: Occupation of the interface cable for connection to Siemens HMI

Configuration of the PacDrive Controller:

RS485 4-wire connection must be set at the Com object.

Configuration of HMI:

FREE SERIAL must be entered as protocol at the interface IF1 B.

NOTE

The interface type of the HMI must be set to RS422 instead of RS485.
The memory organization must be LOW FIRST.

Program in ST:

```
VAR
  Block : ARRAY [ 0 .. 1 ] OF HMI_SIM_DATABLOCK;
  aComHMI: ComHMI;
  Init  : BOOL := TRUE;
  Old   : BOOL;
END_VAR

IF Init THEN
  Init := FALSE;
  ComIecOpen( _ComIec );
  Block[0].Length := 50;
  Block[1].Length := 50;
  aComHMI.NoOfBlocks := 2;
  aComHMI.AdrOfBlocks := ADR( Block );
  aComHMI.ComIecId := _ComIec;
END_IF

aComHMI.LifeControl := TRUE;
aComHMI.Reset := FALSE;
Block[0].Data[19] := 1;(* values 1, 2 and 3 will soon *)
Block[0].Data[20] := 2;(* be sent to the HIM via words *)
Block[0].Data[21] := 3; (* 19, 20 and 21 in block 0 *)

(* reboot HMI *)
(* rising edge on Reboot starts boot procedure *)
(* rising edge on RebootDone signals end of boot procedure *)

aComHMI( Enable := TRUE, Reboot := FALSE );
REPEAT
Old := aComHMI.RebootDone;
aComHMI( Enable := TRUE, Reboot := TRUE );
UNTIL aComHMI.RebootDone AND NOT Old END_REPEAT;

(* Receipt with ID number 100 received by HMI by means of
   control order in data cache e.g. Block[1].Data[20] to
   Block[1].Data[30], depending on the configuration with
   ProTools. The receipt 100 and a data tray must be defined
   with ProTools on the HMI. Rising edge on GiveOrder gives
   the control order. Rising edge on DataReceived confirms
   receipt of requested data. The execution of the control
   order may have been done prematurely by rising edge on
   OrderDone, irrespective of the receipt of data *)

aComHMI( Enable:=TRUE, GiveOrder:=FALSE );
REPEAT
Old := aComHMI.DataReceived;
aComHMI(Enable:=TRUE, Order:=70, Parameter1:=1,
   Parameter2:=0, Parameter3:=0, GiveOrder:=TRUE );
UNTIL aComHMI.DataReceived AND NOT Old END_REPEAT;

Note: The REPEAT-UNTIL loops are meant for demonstration
   purposes only and should be realized by cyclic calls in
   the actual application.
```

NOTE

Notes for project creation in ProTool:

Calculation of block lengths:

In principle, the following applies: The variables of two consecutive blocks 2*i and 2*i+1 for i>=0 occupy the same memory space. E.g. Block[4].Word[3]=Block[5].Word[3]. The blocks 0 and 1 inevitably are an exception, as in block 1 words are only available from 19, whereas in block 0 words are already available from word 9.

Consequently, the block lengths for the blocks 2*i and 2*i+1 result from the highest word used in one of the blocks. Example: If the highest word used in Block 0 is word 23 and the highest word used in block 1 is word 20, the common block length is 24.

There are exceptions if range pointers are used. Range pointers enlarge the block length if the range they define exceeds the highest defined words. However, as some range pointers are defined only for the receive block or only for the send block, they only affect the length of one of these blocks, not both of them at the same time.

Solution: To recognize a common block length reliably, you should define a variable that lies beyond all defined ranges and thus defines the absolute block length.

Variables that are not used must not be taken into account when calculating the block length, as these are not sent/received.

Setting of block priorities:

1) The priority must be set to 0. With any other setting, the HMI will no longer send the block.

Variable configuration:

If the field ‘read always’ is selected for the variables, the block is transmitted or requested with the configured poll time.

When a block is transmitted for the first time, all data are transmitted. For all following transmissions, the block is transmitted only up the variable that changed since the last transmission.

If the field ‘read always’ is not selected, the variables can only be updated by means of a receipt. A command must be given to update a receipt.

7 Appendix

7.1 Contact

For repair

Please send the components to be repaired or checked, along with the error report, to this address:

ELAU AG
Abt. Kundendienst
Postfach 1255
97821 Marktheidenfeld

house address:
Dillberg 12
97828 Marktheidenfeld

Phone: +49 (0) 93 91 / 606-142
Fax: +49 (0) 93 91 / 606-340

Service team

Should you need to talk to a member of our service team or require on-site service, please contact:

ELAU AG
Dillberg 12
D-97828 Marktheidenfeld
Phone: +49 (0) 9391 / 606 - 0
Fax: +49 (0) 9391 / 606 - 300
e-mail: info@elau.de
Internet: www.elau.de

ELAU, Inc.
165 E. Commerce Drive
Schaumburg, IL 60173 - USA
Phone: +1 847 490 4270
Fax: +1 847 490 4206
e-mail: info@elau.com
Internet: www.elau.com

ELAU SYSTEMS ITALIA S.r.l.
Via Tosarelli 300
I-40050 Villanova di Castenaso (BO)
Phone: +39 051 / 7818 70
Fax: +39 051 / 7818 69
e-mail: info@elau.it
Internet: www.elau.it

NOTF

You can find further contact addresses on the ELAU homepage (www.elau.de).

7.2 Further Literature

ELAU can provide you with these manuals and instructions on the PacDrive™ System:[1]

Project Manual

Art.No. 17 13 00 58 - 00x (DE, EN, FR)

Programming Manual

Art.No. 17 13 00 61 - 00x (DE, EN)

Operating Manual MC-4 Servo Drive

Art.No. 17 13 00 62 - 00x (DE, EN, IT, FR)

Operating Manual CAN L2

Art.No. 17 13 00 66 - 00x (DE, EN)

Operating Manual PROFIBUS-DP

Art.No. 17 13 00 67 - 00x (DE, EN)

Operating Manual SM Motor

Art.No. 17 13 00 68 - 00x (DE, EN, IT, FR)

Operating Manual EPAS-4

Art.No. 17 13 00 70 - 00x (DE, EN)

Operating Manual PacDrive Controller MAx-4

Art.No. 17 13 00 71 - 00x (DE, EN, IT, FR)

Operating Manual OPC-Server

Art.No. 17 13 00 73 - 00x (DE, EN)

Operating Manual Device Net

Art.No. 17 13 00 76 - 00x (DE, EN)

Operating Manual HMI Libraries

Art.No. 17 13 00 77 - 00x (DE, EN)

Operating Manual INC-4 Incremental Encoder Module

Art.No. 17 13 00 78 - 00x (DE, EN)

Operating Manual CANopen

Art.No. 17 13 00 79 - 00x (DE, EN)

Operating Manual VarioCam® Editor ECAM-4

Art.No. 17 13 00 80 - 00x (DE, EN)

Operating Manual PacNet Module PN-4

Art.No. 17 13 00 81 - 00x (DE, EN)

Operating Manual SR Motor

Art.No. 17 13 00 82 - 00x (DE, EN)

1. Art.No. -000 (DE) german -001 (EN) english -002 (IT) italian -003 (FR) french

PDM_AnhangStd_us.FM

Operating Manual BusTerminal BT-4/DIO1
Art.No. 17 13 00 83 - 00x (DE, EN)

Operating Manual TTS
Art.No. 17 13 00 88 - 00x (DE)

User Manual Automatic Controller Optimization
Art.No. 17 13 00 89 - 00x (DE, EN)

Operating Manual PacDrive SCL
Art.No. 17 13 00 93 - 00x (DE, EN)

Operating Manual PacDrive PS-4 und PacDrive PD-8
Art.No. 17 13 00 94 - 00x (DE, EN)

Operating Manual Evaluation Kit
Art.No. 17 13 00 95 - 00x (DE)

Operating Manual PacDrive Controller P600
Art.No. 17 13 00 96 - 00x (DE, EN)

Operating Manual PacDrive Controller C200
Art.No. 17 13 00 97 - 00x (DE, EN, FR)

Operating Manual PacDrive Controller C400
Art.No. 17 13 00 98 - 00x (DE, EN, FR)

Operating Manual PacDrive Controller C600
Art.No. 17 13 00 99 - 00x (DE, EN, FR)

7.3 Product Training

We offer practical workshops and seminars.

Our experienced seminar leaders will enable you to make optimum use of the vast possibilities of the PacDrive™ system.

NOTE

Please contact us for further information or to order our seminar program. See also our homepage (www.elau.de).

7.4 Modifications

07 / 2000

- Operating Manual newly written

09 / 2004

- Update Chapter Connection to ModBus
- Update to new Layout

NOTE

The latest documentation and modification service on this product are available on the ELAU Homepage (www.elau.de).

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7.6 Form for Error Report

This error report is absoluteley necessary in order to enable efficient processing.

Send the error report to your ELAU representative or to:

ELAU AG, Abt. Kundendienst
Dillberg 12, D-97828 Marktheidenfeld
Fax: +49 (0) 93 91 / 606 - 340

Sender:

Company:	City:	Date:
Department:	Name:	Phone:

Details of the defective product

Product name: .....

Article number: .....

Serial number: .....

Software version: .....

Hardware code: .....

Parameter enclosed: yes [ ] no [ ]

IEC program enclosed: yes [ ] no [ ]

Details of the machine on which the problem occurred:

Machine producer: .....

Type: .....

Hours of operation: .....

Machine number: .....

Date of commissioning: .....

Producer/Type of machine control:

.....

Description of the problem:

.....

.....

.....

Additional information:

Problem state:	**Causes:**	**Concomitant phenomena:**
[ ] persistent	[ ] unknown	[ ] mechanical problems
[ ] when commissioning	[ ] wiring error	[ ] failure of mains supply (24V)
[ ] occurs sporadically	[ ] mechanical damage	[ ] failure of PMC-2
[ ] occurs after about.....hours	[ ] moisture inside the unit	[ ] motor failure
[ ] occurs in case of shocks	[ ] encoder defective	[ ] broken cable
[ ] depends on temperature		[ ] insufficient ventilation
[ ] foreign object inside unit		

Does the switching cabinet have an air conditioning system?Y/N [ ]

Have similar problems occurred before on the same axis?
How often: .....

Did the problems occur on certain days or times of day?

.....

further information:

.....

.....

.....

.....

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ELAU_FoStoerung_us.FM